

UNIVERSITI TEKNOLOGI MARA

**POLYCYCLIC POLYPRENYLATED
ACYLPHLOROGLUCINOLS FROM
THE BARK OF *Mesua ferrea* AND
THEIR ANTI-DIABETIC ACTIVITY**

NURULFAZLINA EDAYAH BINTI RASOL

Thesis submitted in fulfilment
of the requirements for the degree of
Master of Sciences

Faculty of Applied Sciences

May 2014

CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 7th March 2014 to conduct the final examination of Nurulfazlina Edayah Binti Rasol on his Master of Science thesis entitled “Polycyclic Polyphenylated Acylphloroglucinols from The Bark of *Mesua ferrea* and Their Anti-diabetic Activity” in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The panel of Examiners was as follows:

Khalilah Binti Abdul Khalil, PhD
Faculty of Applied Sciences
Universiti Teknologi MARA
Shah Alam, Selangor
(Chairman)

Ibtisam Binti Abdul Wahab, PhD
Faculty of Pharmacy
Universiti Teknologi MARA
Puncak Alam, Selangor
(Internal Examiner)

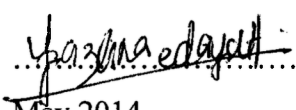
Hasnah Mohd Sirat, PhD
Professor
Department of Chemistry
Faculty of Science
Universiti Teknologi Malaysia
Skudai, Johor
(External Examiner)

SITI HALIJJAH BINTI SHARIFF, PhD
Associate Professor,
Dean,
Institute of Graduate Studies,
Universiti Teknologi MARA,
Date: 23 May 2014

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulation of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree of qualification.

I, hereby, acknowledge that I have been supplied with Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Nurulfazlina Edayah Binti Rasol
Student I.D No	:	2010408222
Programme	:	Master of Science (Natural Products Chemistry)
Faculty	:	Applied Sciences
Thesis Title	:	Polycyclic Polyprenylated Acylphloroglucinols from The Bark of <i>Mesua ferrea</i> and Their Anti-diabetic Activity
Signature of Student	:	
Date	:	May 2014

ABSTRACT

The ethyl acetate extract of the bark of *Mesua ferrea* from Clusiaceae family was studied for its chemical constituent's together with α -amylase and α -glucosidase inhibitory activities for potential anti-diabetic properties. The phytochemistry investigation resulted in the isolation of seven new polycyclic polyprenylated acylphloroglucinols of type B(I). Various chromatographic techniques were used in the isolation process. For fractionation, VLC, TLC and MPLC were employed. Purification of the compounds was accomplished using repeated HPLC technique due to very close retention time. Structures of the isolated compounds were established by means of spectroscopic methods which includes 1D-NMR (^1H and ^{13}C), 2D-NMR (COSY, HSQC, HMBC, NOESY and TOCSY), UV, IR and LCMS. The compounds were named mesuaferroic acid A, mesuaferroic acid B, mesuaferroic acid C, mesuaferroic acid D, mesuaferroic acid E, mesuaferroic acid F and mesuaferroic acid G. Polycyclic polyprenylated acylphloroglucinols have never been reported in *Mesua* species before. All the extracts and isolated compounds were subjected to α -amylase and α -glucosidase inhibitory assays for potential anti-diabetic properties. The results obtained from both assays indicate that the ethyl acetate extract has potential for anti-diabetic with moderate α -amylase and strong α -glucosidase inhibitory activity. The hexane extract showed strong inhibition properties for both assays and methanol showed strong α -amylase but did not show α -glucosidase inhibitory activity. Of the seven pure compounds, mesuaferroic acid D, mesuaferroic acid E and mesuaferroic acid F may be regarded as having moderate anti-diabetic property with IC_{50} values of 345.87 $\mu\text{g/ml}$, 260.97 $\mu\text{g/ml}$ and 349.50 $\mu\text{g/ml}$, respectively in the α -glucosidase inhibition assay as compared to 1-deoxynojirimycin standard IC_{50} values of 102.82 $\mu\text{g/ml}$.

ACKNOWLEDGEMENT

Bismillahirrahmannirahim...

With the name of Allah, The Most Gracious and Most Merciful,
All the praise of Allah S.W.T and salam to our Prophet Muhammad s.a.w with His permission and blessing in giving me the patience and strength in completing my Master's degree.

I would like to express my gratitude to Professor Dr. Nor Hadiani binti Ismail as my supervisor to all her kindness and generosity in giving a lot of guidance, advice, encouragement and information to complete this study.

Further appreciation dedicated as well as to the most important person in my life, my mother and siblings that give a lot of attentions, continues support, advices, love and sharing all my problem and happiness to complete this study with success.

Not forgotten, a special thanks to all staffs and students from Faculty of Applied Sciences and Atta-Ur-Rahman Institute for Natural Products Discovery (RiND) which provide a good facilities, hospitalities and comfortable work space for my study. Also, my heartfelt thanks go to Department of Chemistry of University Malaya in supplying the plant sample of *Mesua ferrrea* (bark) and Mohammad Jemain Bin Mohammad Ridwan, staff of Forest Research Institute Malaysia (FRIM) who give hand in anti-diabetic activity.

My special thanks goes to Mr. Yap Ken Choy (Advanced Chemistry Development, Inc) who has taught me in the ACD/LAB software to elucidate the complicated structures of my compounds and also to Dr. Humera Naz who has assisted me in spectroscopic method as well as helping in elucidating my compounds structure.

To all my friends that are directly or indirectly involved, thank you very much for your ideas, supports, comments and guidance while doing my research. Last but not least, millions thanks also to the Fellowship of UiTM for sponsorship and financial for two years of my study, without this opportunities given I will not be able to continue my dream. May Allah bless all of you.

Nurulfazlina Edayah Binti Rasol
2014